The Latest Facility Technology
In
The Evolving Challenge
For Explosive Safety

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August 1994

Introduction

The construction of safe Explosives Facilities to store, process, handle and load explosives within the Defence Forces of the world is becoming more and more expensive.

The 1991 Gulf War showed that most facilities could be penetrated with a weapon despite significant concrete protection. However, whilst concrete thickness helps, the more concrete the higher the cost of construction. The cost to ensure *total safety* from accidental explosions or direct attacks is becoming too exorbitant. Therefore, we must protect our facilities with external measures, and if they are destroyed, we want them not to effect other facilities situated around them.

Defence Explosives Facilities currently being designed are doing that job. However, traditional methodologies involve sizeable budgets and lengthy construction periods, with major hidden costs such as ongoing maintenance. Governments are demanding Defence Forces use money wisely and obtain *full economical value* for their investment. Spantech Pty Ltd have developed an outstanding system that answers those Government demands.

The Spantech system is a cost effective system, in both time and money. Spantech can construct Explosives Facilities, and most other facilities used within the Defence Forces of the world much cheaper and significantly quicker than current conventional facilities, and ensure the safety of the contents to NATO Standards.

Spantech Involvement With Defence

Spantech became involved in the development of Explosives Facilities while investigating the possibility of using the patented Spantech Construction system for aircraft shelters. The Australian Defence Force (ADF), Army, Navy and Airforce, plus the Australian Defence Industries (ADI) collectively required to build some 300 Explosives Facilities (Storage, Processing and Loading). The costs of building conventional facilities of this quantity were extremely high and the ADF believed that there had to be a cheaper alternative to the current

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
AUG 1994		**00-00-1994 to 00-00-1994**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
The Latest Facility Technology in The Evolving Challenge For Explosive Safety	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Spantech Pty Ltd,36 Hutchinson Street,PO Box 622,Broadbeach 4218, Australia, 4220,**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES
See also ADM000767. Proceedings of the Twenty-Sixth DoD Explosives Safety Seminar Held in Miami, FL on 16-18 August 1994.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**10**	

designs, but still meet NATO Standards.

Note: In 1980, Australia had endorsed the use of the NATO Safety Principles for the Storage of Ammunition and Explosives.

What Is The Spantech System?

The Spantech Construction System is based on curved steel construction panels that interlock to form a free spanning arched structure. The panels are manufactured on site in continuous lengths, maximising panel performance and reducing overall costs. Panels clip together without screws or bolts and form unsupported spans of up to 30 metres, eliminating internal columns and significantly increasing the useable floor storage or work space. Larger spans can be achieved with the addition of minimal structural support.

The panel becomes permanent formwork for layers of reinforcing steel, concrete and earth. The result is a permanent arched structure that can be applied to any defence construction requirement. The standard Spantech Facility (a quonset style design) takes full advantage of the speed of construction and design versatility, typical of the system.

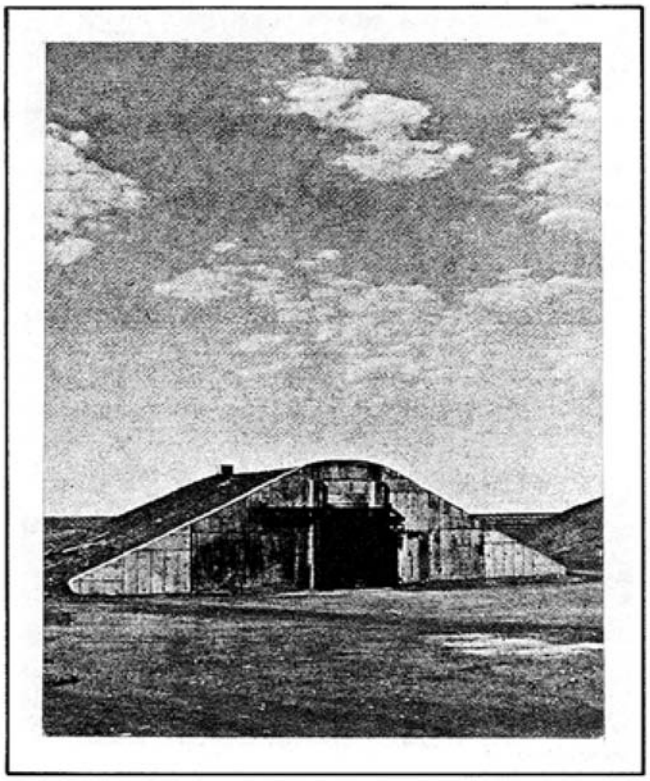
The Spantech Igloo

Now a commonly phrased term, to differentiate it from conventional igloos, the Spantech Igloo was initially designed to be a building 13 metres wide by 20 metres long. Australian Construction Service, the Australian Government's independent construction body, was requested to carry out an independent desktop study to determine the feasibility of the building meeting NATO Standards. The study concluded beyond doubt, that the Spantech building would be an acceptable igloo design.

The Royal Australian Air Force (RAAF) and ADI finally settled on a 13 metre Spantech Igloo with approximate dimensions being 13 metres wide by 13 metres long by 4.75 metres high. The igloo would have a storage space for up to 144 pallets and be licensed for a maximum Net Explosives Quantity (NEQ) of 75,000kgs of Hazard Division (HD) 1.1 EO.

The result is a functional, economical structure that can be incorporated into existing Explosives Storage Areas or exclusively in new depots.

The prototype 13m Spantech Igloo



The prototype 13m Spantech Igloo

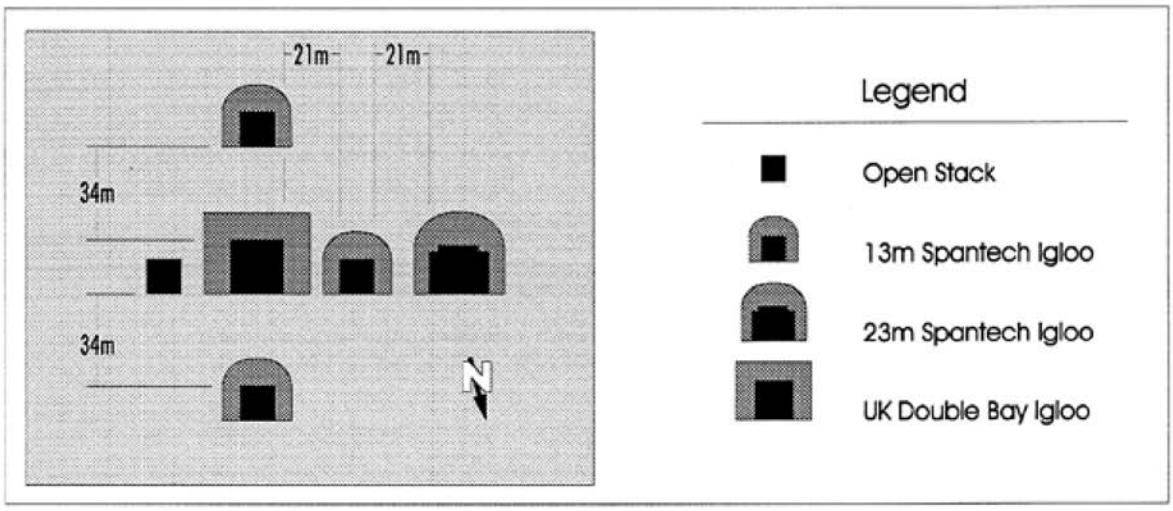
Although the desktop study had confirmed the acceptability of the Spantech Igloo, the Australian Department of Defence would not accept the design until it was fully tested to NATO Standards.

Coincidentally, a trial, under the Joint Australian/United Kingdom Stack Fragmentation Trials Program, was being organised to conduct a full scale trial of the UK Double Bay, Box Igloo. The Box Igloo had been accepted as a NATO designed igloo, but had never been subjected to full scale tests. The trial provided an opportunity to test the Spantech Igloo's structural performance under the effects of an adjacent detonation.

The Trial

There were two stages planned for this trial. Stage one, using 75,000kgs of HD 1.1 EO in the donor UK Igloo and exposing three Spantech Igloos to the detonation. Stage two, using 75,000kgs of HD 1.1 EO in an open air blast, exposing the same three Spantech Igloos to the detonation.

The combined site layout for all Spantech related stages of the trials



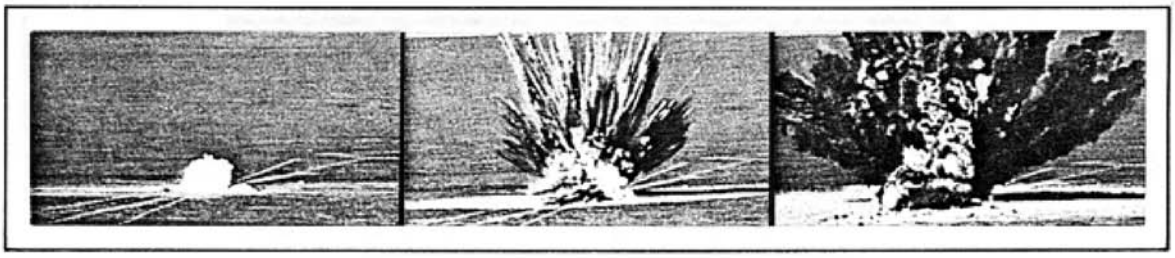
The combined site layout for all Spantech related stages of the trials

Stage One

Three Spantech Igloos were constructed, around the UK Igloo to test the front, rear and side of the Spantech Igloos. The igloos were positioned for testing as 7 Bar Igloos with separation distances of 34 metres front to rear to the donor and 21 metres side to side.

The detonation destroyed the UK Igloo, as expected, sending fragments of up to one tonne in weight over one kilometre from ground zero. All Spantech Igloos survived the detonation. The igloo to the front of the donor was hit by two very large concrete fragments, each approximately 2.5 tonne in weight. These fragments are an inherent feature of the concrete box designed igloo. One of the blocks damaged the rear of the 13m Spantech Igloo, however, data from the site determined that the igloo would have still fully protected its contents.

Three stages of the 75,000 kg blast



Three stages of the 75,000 kg blast

Stage Two

The second detonation, the open air blast, was designed to establish the blast suppression characteristics of the UK Igloo. It was also an opportunity to see how the Spantech Igloos would stand up to a second blast, particularly the damaged igloo. Again all three Spantech Igloos survived the second detonation. The damaged igloo had no more significant damage from the second detonation and would still have protected the contents of the igloo.

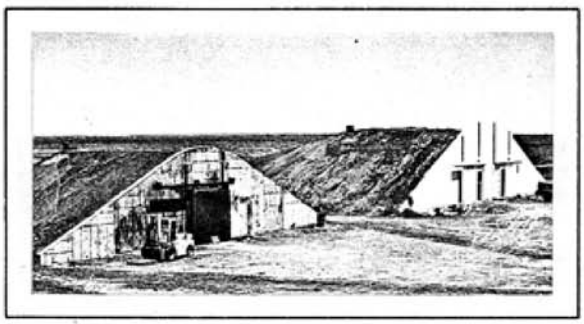
The 13 metre Spantech *Igloo had proven itself.*

The 23 Metre Spantech Trial

Although the 13 metre Spantech Igloo had proven itself and was ideal for the RAAF and ADI, the building was not suitable for either the Army or Navy, who required a larger facility. Consequently, Spantech began developing a larger igloo. This initiated the third trial that would subject Spantech Igloos to another 75,000 kg detonation, and which was also recommended in the first trial to test the fragmentation pattern of the new igloo.

The donor would be the Igloo that was subjected to the first two detonations from the side. A 23 metre Spantech Igloo was built 21 metres to the side of the donor.

Before: the 13m Spantech Igloo donor is to the left
After: the donor is destroyed leaving the 23m Spantech Igloo receptor in tact



Before: the 13m Spantech Igloo donor is to the left

After: the donor is destroyed leaving the 23m Spantech Igloo receptor in tact

The detonation naturally destroyed the donor, however, the fragmentation search revealed that the lethal-fragment density was only 0.5 per unit area at 600 metres and less that 0.1 at 900 metres. This meant that the debris density for the Spantech Igloo at Inhabited Building Distances is below one lethal fragment per 55.7 square metres. The Spantech Igloo performed much better that the conventional igloo.

The two remaining 13 metre Spantech Igloos and the new 23 metre Igloo again successfully survived the blast. The two remaining 13 metre Spantech Igloos had now been subjected to three 75,000 kg detonations... a situation most storehouses would never experience.

The data collected from all three detonations verified the Spantech Igloos had fully met the NATO Standards for 7 BAR Igloos. On 28 August, 1992, the Australian Ordnance Council confirmed that Spantech Pty Ltd had successfully designed 7 Bar Igloos to NATO Standards.

Further trials are now being considered to test the igloos with HD 1.2 and 1.3 EO. Information on these trials will be presented at this Seminar by the Secretary UK ESTC.

Construction Programs

Following the first tests, work began on several 13 m Spantech Igloo projects. Spantech Pty Ltd has completed Explosive Storehouse projects in Australia for the RAAF at three major bases. A further project of 20 igloos was completed for ADI.

The first project to use the 23 m Spantech Igloo was for the Australian Army's expansion of it's main Explosives Wholesale Munitions Depot. A total of 34 igloos were built and handed over to the Army in November 93. The construction site for the Army project was within an

operational EO Storage Deport and was designed to achieve the most economical configuration possible. A video is available to illustrate special features of the construction process.

The 23m Spantech Igloo used extensively by the Australian Army
Fork lifts are provided direct access to maximise operational efficiency

The 23m Spantech Igloo used extensively by the Australian Army

Fork lifts are provided direct access to maximise operational efficiency

Other Projects

The Spantech Construction System has been used in other projects, such as, EO Process Facilities, Command Centres and Operations Technical Facilities.

Further projects are being negotiated with overseas countries which will involve the construction of significant numbers of facilities.

So Why Build Spantech?

Spantech Igloos and other Spantech Facilities are ***fast*** to build, more ***economical*** than conventional facilities and can be designed to fit any requirement, making the system very ***versatile***.

Fast

The speed of construction in itself is an economic saving. Some examples of the reduced time taken in building Spantech Facilities are:

a. Spantech Pty Ltd manufactured and erected the structure of a 90 metre long ground to ground building in 4 days using 6 men.

b. In the remote testing location a single 23 metre Spantech Igloo was constructed in 51

days, while the construction of the UK Box Igloo took five months (150 days).

c. When planning for the expansion of the Australian Army's main Explosives Wholesale Munitions Depot, the construction time for a project of 30 igloos was compared directly: the UK Double Bay Igloos - 102 weeks; the 23 metre Spantech Igloo - 51 weeks. Spantech won the project, and four additional igloos were added to the contract half-way through construction... all 34 Igloos were still completed within the 51 weeks.

Economical

On many occasions Spantech Igloos and other Spantech Facilities have proven that project costs have been dramatically reduced by using the Spantech Construction System.

For example, the originally budget for the Australian Army's main Explosives Wholesale Munitions Depot allowed for 30 UK Box Igloos. The completed project of 34 Spantech Igloos remained fifty percent (50%) cheaper than the original budget.

Versatile

The Spantech Construction System can be used for commercial buildings, industrial buildings, educational buildings, recreational buildings and of course, why we are here, Defence Facilities.

Defence Facilities may be considered as either General or Operational. The General area includes non-hardened buildings for Administration, Accommodation, Mess Halls, General Workshops, Computer Centres, Supply Warehouses, Recreational Centres and Vehicle Parking.

The Operational area includes hardened buildings for Technical Workshops, Personnel Shelters, Tunnels, Aircraft Weather Shelters, Aircraft Maintenance Hangers, Small Arms Weapons Facilities and Explosives Facilities.

A Spantech Aircraft Shelter

A Spantech Aircraft Shelter

The types of Explosives Facilities incorporating the Spantech Construction System are:

a All types of Explosives Storehouses, both igloo and light frangible.

b. Explosives Process Buildings such as Inspection, Proof and Maintenance.

c. Missile Maintenance Facilities.

d. Hardened Shelters for Personnel, Weapons, Tanks, Aircraft and even Small Ships.

The use of the Spantech Construction System in constructing facilities is limited only by its design constraints.

Quality

Quality is Spantech. Spantech is committed to providing facilities of the highest integrity. The company implemented a Quality Assurance system in accordance with the requirements of ISO 9001 (AS 3901). This independently audited quality system provides stringent controls for the development of designs through each phase of construction to completion.

In 1993, Spantech Pty Ltd was awarded the Australian Department of Defence's Industry Quality and Achievement Award in the Facilities category.

Advantages Of Spantech

The major advantages of the Spantech Construction System in defence facilities are:

a. Economical to build, savings of up to 40 % of conventional construction costs.

b. Construction time is significantly shorter, up to 60% faster than conventional facility construction.

c. Has been fully tested to 7 Bar Igloo NATO standards.

d. The fragmentation from a detonation is dramatically reduced.

e. Spantech's steel panel reduces the potential of spalling occurring within a receptor igloo.

f. The steel panel acts as a natural shield against radio frequency interference.

g. The structure is low maintenance, significantly reducing ongoing operational costs.

h. All underground facilities can be completely waterproofed and have excellent natural ventilation.

Conclusion

Spantech Pty Ltd has developed a system that not only saves time and money, but has significantly reduced the amount of large fragmentation emanating from a facility that has been destroyed by an explosion. The Spantech Construction System is truly part of the Evolving Challenge for Explosive Safety.